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(71)Applicant : **ATAKA CONSTRUCTION & ENGINEERING CO LTD**

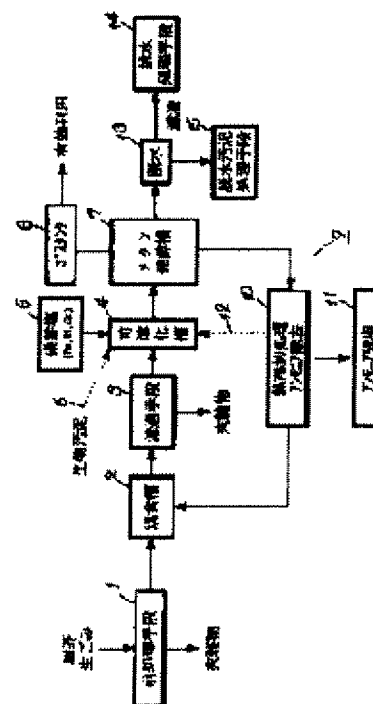
(72)Inventor : RI GYOKUYU
TORII HISAMICHI
SASAKI HIROSHI
SEKI HIROJI

(54) WASTE TREATMENT METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a waste treatment method which is capable of efficiently and easily treating solid organic waste.

SOLUTION: The solid organic wastes are disintegrated and crushed by a pretreating means 1 and impurities are removed therefrom. The solid organic wastes and a liquid mixture after methane fermentation from a return means 9 are heated and mixed in a mixing tank 2 and the mixture is refined to liquid organic wastes of 10 to 15% in TS concentration. After the impurities are removed from the liquid organic wastes in a filter means 3, the liquid organic wastes are mixed with suitable nutrient salts or biological sludge in a solubilizing tank 4, by which the liquid mixture is refined. The liquid mixture is subjected to a methane fermentation treatment in a methanogenic tank 5 and gaseous methane is recovered. A part of the liquid mixture is heated by steam in a hot alkali treating means 6 and nitrogen compounds are removed by a stripping treatment means 7. The liquid mixture is subjected to a solubilizing treatment to solubilize bacterial and refractory organics and



tank 2. There is no need for diluting water, and waste water and sludge are decreased. The efficient treatment is made possible.

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CLAIMS

[Claim(s)]

[Claim 1] The waste treatment approach which mixes said sludge by which methane fermentation processing was carried out to said solid organic waste, and is characterized by said thing [carrying out methane fermentation processing] after this mixing in the waste treatment approach of processing a solid organic waste by methane fermentation processing.

[Claim 2] The mixed rate of the sludge and the solid organic waste by which methane fermentation processing was carried out is the waste treatment approach according to claim 1 characterized by being the rate that the total solid concentration after mixing (TS concentration) becomes 15% or less 10% or more.

[Claim 3] The waste treatment approach according to claim 1 or 2 characterized by removing a nitride before mixing the sludge by which methane fermentation processing was carried out to a solid organic waste.

[Claim 4] Removal of a nitride is the waste treatment approach according to claim 3 characterized by carrying out stripping processing.

[Claim 5] Removal of the nitride by stripping processing is the waste treatment approach according to claim 4 characterized by using steam.

[Claim 6] Claim 1 characterized by adding alkali, heating before mixing the sludge by which methane fermentation processing was carried out to a solid organic waste thru/or the waste treatment approach given [any 1] in five.

[Claim 7] The waste treatment approach according to claim 6 characterized by contacting steam and heating it.

[Claim 8] The waste treatment approach according to claim 6 or 7 characterized by carrying out methane fermentation processing at the mixture of the sludge by which methane fermentation processing was carried out on the occasion of methane fermentation processing, and a solid organic waste, and adding heating and some sludge [at least] by which alkali treatment was carried out.

[Claim 9] Claim 1 characterized by the thing of an iron compound, a cobalt compound, and a nickel compound for which any one sort is added at least at the mixture of the sludge by which methane fermentation processing was carried out, and a solid organic waste thru/or the waste treatment approach given [any 1] in eight.

[Claim 10] Claim 1 characterized by adding the excess sludge produced by biological treatment into the mixture of the sludge and the solid organic waste by which methane fermentation processing was carried out thru/or the waste treatment approach given [any 1] in nine.

[Claim 11] Claim 1 characterized by mixing to a solid organic waste where the sludge by which methane fermentation processing was carried out is kept warm thru/or the waste treatment approach given [any 1] in ten.

[Claim 12] Claim 1 characterized by removing impurity from a solid organic waste before mixing with the sludge by which methane fermentation processing was carried out thru/or the waste treatment approach given [any 1] in 11.

[Claim 13] Claim 1 characterized by removing impurity before carrying out methane fermentation processing after mixing the sludge and the solid organic waste by which methane fermentation processing was carried out thru/or the waste treatment approach given [any 1] in 12.

[Claim 14] Claim 1 characterized by carrying out solubilization processing at 55-degree-C or more elevated temperature 60 degrees C or less, and carrying out methane fermentation processing in a 35**5-degree C moderate temperature region after [this] carrying out solubilization processing in case methane fermentation processing is carried out thru/or the waste treatment approach given [any 1] in 13.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the waste treatment approach which carries out methane fermentation processing of the solid organic waste.

[0002]

[Description of the Prior Art] The waste treatment approach of collecting valuables, such as a solid fuel, fertilizer, and methane, is learned processing easily the solid solid organic waste which are kitchen garbages, such as garbage, in biological treatment etc. at a back process in the condition which can be processed so that it may be shown in the former, for example, drawing 3 .

[0003] The waste treatment approach shown in this drawing 3 is crushed carrying out judgment removal of the impurity which cannot carry out [group / styrene foam metallurgy] biological treatment of the solid organic waste which are kitchen garbages, such as garbage collected for example, by the collection vehicle etc., with the pretreatment means 21. And supplying suitably the excess sludge which produces the solid organic waste classified and crushed with this pretreatment means 21 by treatment of human waste etc. in a water pan in a mixing chamber 22, it dilutes and adjusts so that the total solid concentration (TS (Total Solids) concentration) may become 10% - about 15%. Next, methane fermentation of the solid organic waste adjusted by the mixing chamber 22 will be carried out 15 days or more by the methane fermentation tub 23 at the moderate temperature of 35**5 degrees C, or a 55**5-degree C elevated temperature, and methane will be collected.

[0004] Then, solid liquid separation is carried out with the dehydration means 24, such as the filter press and centrifugal separation, the separated filtrate carries out purification processing with the waste-water-treatment means 25, and the separated dewatered sludge cake carries out processing processing by the treatment facility 26 at fertilizer, a solid fuel, the charge of reclamation material, etc. In addition, carry out complete treatment of the wastewater processed with the waste-water-treatment means 25 further, and it is discharged, or is returned to a mixing chamber 22 in part, and is used for adjustment of a solid organic waste.

[0005]

[Problem(s) to be Solved by the Invention] However, by the waste treatment approach as shown in above-mentioned drawing 3 , since a dilution water is added in case TS concentration is adjusted, in order to carry out methane fermentation efficiently, in order to discharge besides the methane of valuables, or a solid fuel, wastewater to be processed arises so much separately as an end product of processing. That is, in order for TS concentration to dilute solid organic wastes, such as a kitchen garbage, from 10% to about 15%, generally twice [more than] as many water as this is needed, and a displacement increases. For this reason, while the load concerning waste water treatment increases and a complicated large-sized processor is needed, processing cost increases.

[0006] Then, it is possible to return the wastewater from a waste-water-treatment process mostly to a whole-quantity mixing chamber, and to use as a dilution water. However, since the carbon / nitrogen (C/N) ratio of the solid organic waste collected are small, increase in efficiency of methane fermentation

processing cannot be desired by the ammonia inhibition or organic-acid inhibition by are recording of the ammonia or the organic acid which are generated in the case of methane fermentation. For this reason, while the surplus dewatered sludge which is a dewatered sludge cake while the cracking severity of a solid organic waste does not increase and being unable to desire increase of the amount of generation of methane arises so much, the load concerning the treatment facility of surplus dewatered sludge increases and a complicated large-sized processor is needed, there is a problem on which processing cost increases.

[0007] This invention aims at offering the waste treatment approach that a solid organic waste can be processed easily efficiently, in view of the above-mentioned trouble.

[0008]

[Means for Solving the Problem] In the waste treatment approach of processing a solid organic waste by methane fermentation processing, the waste treatment approach according to claim 1 mixes said sludge by which methane fermentation processing was carried out to said solid organic waste, and is said thing which carries out methane fermentation processing after this mixing.

[0009] And in order to carry out methane fermentation processing again after returning the sludge by which methane fermentation processing was carried out to a solid organic waste and mixing, While a temper is carried out to the total solid concentration (TS concentration) which did not need to add and dilute water to a solid organic waste, and was suitable for methane fermentation processing, methane fermentation processing effectiveness improves and the amount of generation of methane increases The amount of the wastewater discharged and the amount of excess sludge decrease, the load of purification processing of wastewater and processing of excess sludge decreases at a back process, and a solid organic waste is processed efficiently.

[0010] The mixed rate of the sludge and the solid organic waste with which methane fermentation processing of the waste treatment approach according to claim 2 was carried out in the waste treatment approach according to claim 1 is a rate that the total solid concentration after mixing (TS concentration) becomes 15% or less 10% or more.

[0011] And in order to mix the sludge by which methane fermentation processing was carried out, and a solid organic waste at a rate that TS concentration becomes 15% or less 10% or more, it becomes concentration [fitness / at the time of carrying out methane fermentation processing], and methane fermentation processing effectiveness improves. In addition, if the total solid concentration is lower than 10%, the concentration of the organic substance which carries out methane fermentation processing will decrease, the yield of the methane to kinetic energy decreases, and the effectiveness of methane fermentation falls. Moreover, if the total solid concentration is higher than 15%, while viscosity will increase, by existence of the solid organic substance, it stops being able to carry out decomposition processing of the organic substance for a short time, and the effectiveness of methane fermentation falls to homogeneity. For this reason, before carrying out methane fermentation processing, the total solid concentration is set up to 15% or less 10% or more.

[0012] In the waste treatment approach according to claim 1 or 2, the waste treatment approach according to claim 3 removes a nitride, before mixing the sludge by which methane fermentation processing was carried out to a solid organic waste.

[0013] And in order to mix with a solid organic waste after removing nitrides, such as ammoniacal nitrogen, from the sludge by which methane fermentation processing was carried out, are recording of a nitride is prevented, and it processes efficiently, without checking methane fermentation processing.

[0014] The waste treatment approach according to claim 4 carries out stripping processing of the removal of a nitride in the waste treatment approach according to claim 3.

[0015] And in order to remove a nitride by stripping processing, separation removal is easily carried out from sludge with an easy configuration, without adding an additive, and processing effectiveness improves.

[0016] Removal of the nitride according [the waste treatment approach according to claim 5 / on the waste treatment approach according to claim 4 and] to stripping processing uses steam.

[0017] And in order to contact steam to sludge and to remove a nitride by the stripping processing by

steam, while a nitride is easily removed with an easy configuration. The energy which sludge is heated with steam, and is heated in case it mixes with a solid organic waste and TS concentration is adjusted decreases. Moreover, the bacteria in sludge will become extinct and solubilized, and will be processed by methane fermentation processing. In the latter part, the amount of sludge generated by processing of a solid organic waste decreases, and a solid organic waste is processed efficiently.

[0018] It adds alkali in the waste treatment approach claim 1 thru/or given [any 1] in five, heating it, before the waste treatment approach according to claim 6 mixes the sludge by which methane fermentation processing was carried out to a solid organic waste.

[0019] And in order to mix with a solid organic waste after reforming and solubilizing the organic substance which remains while adding alkali and becoming extinct and solubilizing bacteria, heating to the sludge by which methane fermentation processing was carried out and which is hard to disassemble, it is decomposed by latter methane fermentation processing, the amount of sludge generated by processing of a solid organic waste reduces bacteria and the organic substance which remains, and a solid organic waste is processed efficiently.

[0020] In the waste treatment approach according to claim 6, the waste treatment approach according to claim 7 contacts steam, and heats it.

[0021] And in case alkali is added, in order to contact steam and to heat it, while heating becomes easy with an easy configuration, stripping processing of the nitride in sludge is carried out by contact of steam, separation removal is easily carried out from sludge, recording of a nitride is prevented, the load at the time of being methane fermentation processing decreases, methane fermentation processing goes on efficiently, and processing effectiveness improves.

[0022] In the waste treatment approach according to claim 6 or 7, methane fermentation processing is carried out at the mixture of the sludge by which methane fermentation processing was carried out on the occasion of methane fermentation processing, and a solid organic waste, and the waste treatment approach according to claim 8 adds heating and some sludge [at least] by which alkali treatment was carried out.

[0023] And it prevents that methane fermentation processing is carried out at the mixture of the sludge by which methane fermentation processing was carried out on the occasion of methane fermentation processing, and a solid organic waste, and add heating and some alkaline sludge [at least] by which alkali treatment was carried out, bioactive falls when an acid degree advances in the organic acid generated in the case of methane fermentation processing, and processing effectiveness decreases.

[0024] The waste treatment approach according to claim 9 is a thing of an iron compound, a cobalt compound, and a nickel compound which adds any one sort at least at the mixture of the sludge by which methane fermentation processing was carried out, and a solid organic waste in the waste treatment approach claim 1 thru/or given [any 1] in eight.

[0025] And into the mixture of the sludge by which methane fermentation processing was carried out, and a solid organic waste, in order [of an iron compound, a cobalt compound, and a nickel compound] to add any one sort at least, nutrient salt balance required for the activity of a microorganism is secured, and methane fermentation processing effectiveness improves.

[0026] The waste treatment approach according to claim 10 adds the excess sludge produced by biological treatment into the mixture of the sludge and the solid organic waste by which methane fermentation processing was carried out in the waste treatment approach claim 1 thru/or given [any 1] in nine.

[0027] And in order to add the excess sludge produced by biological treatment into the mixture of the sludge and the solid organic waste by which methane fermentation processing was carried out, while moisture is supplied from excess sludge and adjustment of TS concentration becomes easy, nutrient salt required for the activity of a microorganism is supplied from excess sludge, it is not necessary to add nutrient salt separately, processing effectiveness improves, and the excess sludge produced by biological treatment is also processed.

[0028] In the waste treatment approach claim 1 thru/or given [any 1] in ten, the waste treatment approach according to claim 11 is mixed to a solid organic waste, where the sludge by which methane

fermentation processing was carried out is kept warm.

[0029] And in order to return where the sludge by which methane fermentation processing was carried out is kept warm, and to mix with a solid organic waste, the energy heated in case it mixes with a solid organic waste and TS concentration is adjusted decreases, and processing effectiveness improves.

[0030] In the waste treatment approach claim 1 thru/or given [any 1] in 11, the waste treatment approach according to claim 12 removes impurity from a solid organic waste, before mixing with the sludge by which methane fermentation processing was carried out.

[0031] And in order to mix with the sludge by which methane fermentation processing was carried out after removing impurity from a solid organic waste, while adjustment of TS concentration becomes easy, it is not necessary to heat a part for impurity in the case of adjustment of TS concentration, the energy efficiency to heat improves, and processing effectiveness improves.

[0032] In the waste treatment approach claim 1 thru/or given [any 1] in 12, the waste treatment approach according to claim 13 removes impurity, before carrying out methane fermentation processing after mixing the sludge and the solid organic waste by which methane fermentation processing was carried out.

[0033] And in order to carry out methane fermentation processing after mixing the sludge and the solid organic waste by which methane fermentation processing was carried out and removing impurity, while the load in the case of methane fermentation processing decreases, it is not necessary to heat a part for impurity in the case of methane fermentation processing, and processing effectiveness improves.

[0034] In the waste treatment approach claim 1 thru/or given [any 1] in 13, in case methane fermentation processing is carried out, the waste treatment approach according to claim 14 carries out solubilization processing at 55-degree-C or more elevated temperature 60 degrees C or less, and after [this] carrying out solubilization processing, it carries out methane fermentation processing in a 35**5-degree C moderate temperature region.

[0035] And after carrying out solubilization processing beforehand before methane fermentation processing at altitude at 55-degree-C or more elevated temperature 60 degrees C or less, in order to carry out methane fermentation processing in a 35**5-degree C moderate temperature region, a heavy load with high TS concentration also controls the fall of the microorganism activity by extensive generating of an organic acid, and carries out methane fermentation processing efficiently. Here, if it becomes lower than 55 degrees C, solubilization processing will not fully be carried out, but since bioactive will decrease, solubilization processing will not fully be carried out and improvement in the methane fermentation effectiveness in the latter part cannot be aimed at if it becomes higher than 60 degrees C, solubilization processing is carried out to 55 degrees C or more 60 degrees C or less. Moreover, if temperature becomes low from 30 degrees C, methane fermentation will not advance efficiently, but if it becomes higher than 40 degrees C, since organic-acid inhibition will be produced, it is set as a 35**5-degree C moderate temperature region.

[0036]

[Embodiment of the Invention] Hereafter, the configuration of the wastes treatment equipment in one gestalt of operation of this invention is explained with reference to drawing 1.

[0037] the kitchen garbage which 1 was a pretreatment means, and this pretreatment means 1 has the crushing shaft of biaxial [a biaxial face width is 20**5mm], three shafts, or four shafts, and were collected by the collection vehicle etc. in drawing 1, garbage, and agriculture, forestry and fishery -- it has bag tearing or solution shredding equipment to crush and which is not illustrated for solid organic wastes which mainly contain the solid organic substance, such as office trashes, such as ** trash and food-processing trash. Moreover, the pretreatment means 1 is equipped with the sorting means with the judgment equipment from which impurity contained in a metal removal means which is not illustrated by which magnetic selection etc. removes the impurity of metals, such as a piece of iron and aluminum, and a solid-like organic waste, in the debris by which solution crushing was carried out with solution shredding equipment, such as a bag made of synthetic resin and plastics, is removed and which is not illustrated. In addition, as a pretreatment means, bag tearing and the bag tearing selector crushed and sorted out may be used for a solid organic waste by the centrifugal force and buoyancy sorting.

[0038] And the mixing chamber 2 is connected to this pretreatment means 1. the solid organic waste to which the head end process of this mixing chamber 2 was carried out [removal / crushing, / of impurity / judgment] with the pretreatment means 1 -- the total predetermined solid concentration (TS (Total Solids) concentration) -- for example, it adjusts to the liquefied organic waste of the shape of 10% - 13% of a slurry preferably 10% to about 15%. and warming which warms the solid organic waste thrown into this mixing chamber 2 to the stirring means which carries out stirring mixing, and which is not illustrated, and an about 55 degrees C - 60 degrees C elevated temperature -- it has an impurity discharge means to discharge impurity with the heavy mass of the metal which remains without being removed by a means and the pretreatment means 1, a stone, etc.

[0039] Moreover, the filtration means 3 is connected to the mixing chamber 2. It has the drum details screen whose scale-spacing dimension is 10mm - 15mm, and this filtration means 3 removes impurity which was not able to be removed with the pretreatment means 1, such as a fine bag made of synthetic resin, and plastics, from the liquefied organic waste by which the temper was carried out to the shape of a slurry whose TS concentration is 10% - about 15% by the mixing chamber 2. The filtration means 3 is equipped with the screw press which carries out dehydration separation of the impurity removed on the drum details screen.

[0040] Furthermore, the solubilization tub 4 which is a depot which stores the liquefied organic waste from which impurity was removed on the drum details screen, and the dehydration filtrate which carried out dehydration separation in the screw press is connected to the filtration means 3. This solubilization tub 4 is equipped with an incubation means which is not illustrated to keep warm the mixed liquor of the liquefied organic waste to store and dehydration filtrate to an about 55 degrees C - 60 degrees C elevated temperature, a stirring means to stir mixed liquor, and pH detection means, and solubilization and souring of the solid organic substance in the mixed liquor to store are made it.

[0041] Moreover, a nutrient salt addition means 5 to add the nutrient salt of a microorganism is formed in mixed liquor at the solubilization tub 4. As this nutrient salt to add, iron, nickel, and cobalt are any one salts at least, and preferably, as a part for 10 mg/l - 300 mg/l and nickel, as a part for 1 mg/l - 30 mg/l and cobalt, 1 or more mg/l of 1 or more mg/l of 10 or more mg/l of iron adds in mixed liquor so that it may become 1 mg/l - 30 mg/l preferably.

[0042] Furthermore, the injection way 6 which throws in the living thing sludge which is excess sludge separately produced in treatment of human waste etc. is connected to the solubilization tub 4. In addition, it is not necessary to form this injection way 6. Moreover, when the rate which adds living thing sludge becomes 25% or more by TS concentration, since the nutrient salt of the minute amount which run short with a solid organic waste is filled up from living thing sludge, it does not need to add nutrient salt.

[0043] And the methane fermentation tub 7 which the mixed liquor by which the temper was carried out to the description which is easy to carry out methane fermentation by the solubilization tub 4 flows, and is stored is connected to the solubilization tub 4. This methane fermentation tub 7 is equipped with the temperature adjustment device which maintains the mixed liquor to store at 35**5 degrees C of a moderate temperature and which is not illustrated, and a stirring means to stir mixed liquor.

[0044] Moreover, the gas holder 8 stored in order to collect the methane generated by methane fermentation processing and to reuse as a fuel separately is connected to the methane fermentation tub 7.

[0045] Furthermore, a return means 9 to return a part of mixed liquor to store to a mixing chamber 2 is connected to the methane fermentation tub 7. Alkali, such as a sodium hydroxide, is added into the mixed liquor returned to this return means 9. And alkalinity, For example, the alkali adjustment device which adjusts pH to nine to about ten, and reforms and solubilizes the bacteria and the organic nature solid which remains, and which is hard to disassemble in mixed liquor and which is not illustrated, Mixed liquor is prepared in the heat alkali treatment means 10 equipped with a heat treatment means to heat preferably 70 degrees C - about 90 degrees C before and after 80 degrees C with steam, and to become extinct and solubilize the anaerobic bacterium in mixed liquor.

[0046] In addition, since steam stripping arises and nitrides, such as ammoniacal nitrogen in mixed

liquor (NH₃-N), are removed by the steam for heating, the heat treatment means of this heat alkali treatment means 10 functions also as an ammonia removal means.

[0047] And an ammonia recovery means 11 to collect nitrides, such as ammonia, with steam is connected to this heat alkali treatment means 10. This ammonia recovery means 11 stored the aqueous acids which are inorganic-acid water solutions, such as a sulfuric acid and a hydrochloric acid, made the steam containing a nitride penetrate in aqueous acids, and is equipped with the acid tub which a nitride is deposited as an ammonium sulfate, an ammonium chloride, etc., and collects them and which is not illustrated.

[0048] In addition, as for this return means 9, it is desirable that heat insulation processing which does not fall while the temperature of the mixed liquor returned to a mixing chamber 2 from the methane fermentation tub 7 returns is performed, namely, the time of carrying out the temper of the solid organic waste by the mixing chamber 2 -- warming of a mixing chamber 2 -- the mixed liquor heated to 70 degrees C - about 90 degrees C with the heat alkali treatment means 10 being returned, and being mixed with a solid organic waste, although warmed by the about 55 degrees C - 60 degrees C elevated temperature with a means -- warming -- a means is not established -- it is -- it is -- warming -- warming by the means -- it is because big reduction of energy can be aimed at. In addition, the amount of this mixed liquor returned is set as the 1 to 1.5 times as many range as this to the mass of a solid organic waste corresponding to the addition of the living thing sludge thrown into the water content and the solubilization tub 4 of a solid organic waste from the pretreatment means 1.

[0049] Furthermore, the return injection way 12 which functions on the heat alkali treatment means 10 of the return means 9 as a pH adjustment device which supplies a part of mixed liquor to return suitably corresponding to pH of the mixed liquor in the solubilization tub 4 is formed. Namely, although an organic acid is generated by solubilization and souring and pH of mixed liquor serves as acidity which is about five in the solubilization tub 4 If pH serves as acidity further, since the bioactive in the solubilization tub 4 will decrease, solubilization processing effectiveness, such as organic acid fermentation, will decrease and the methane fermentation processing effectiveness in a back process will fall further, Since it is necessary to neutralize an acid degree to a neutrality side to some extent, the mixed liquor by which heat alkali treatment of the pH was carried out to nine to about ten through the return injection way 12 is supplied, and pH is adjusted.

[0050] Moreover, the dehydration means 13 which dehydrate and carry out solid liquid separation of the mixed liquor to store to dehydration filtrate and a dewatered sludge cake, such as a centrifugal dehydrator, a rotating-disc form dehydrator, and a screw press, are connected to the methane fermentation tub 7. And a flocculant addition means which is not illustrated to add polymer coagulants, such as for example, the poly amidine and Pori iron, is formed in this dehydration means 13. Moreover, the dewatered sludge cake by which dehydration separation was carried out is connected with the wastewater-treatment means 14 which carries out purification processing of the dehydration filtrate by which dehydration separation was carried out at the dehydration means 13 in a dewatered sludge processing means 15 to compost to dry and to process in fertilizer etc.

[0051] Next, actuation of one gestalt of the above-mentioned implementation is explained.

[0052] First, while magnetic selection etc. removes the impurity of metals, such as a piece of iron, and aluminum, with a metal removal means with the solution shredding equipment with which the pretreatment means 1 does not illustrate the solid organic waste collected, for example by the collection vehicle etc. bag tearing or after crushing, judgment equipment removes impurity, such as a bag made of synthetic resin, and plastics.

[0053] And the solid organic waste from which solution crushing was carried out with this pretreatment means 1, and impurity was removed is thrown into a mixing chamber 2. The temper of the liquefied organic waste of the shape of a slurry which also mixes the massive object with which the total solid concentration (Total Solids:TS) which is the total-residue-on-evaporation concentration in which stirring mixing is possible becomes 15% or less 10% or more is carried out carrying out stirring mixing with the mixed liquor returned from the return means 9, warming suitably, and holding at about 55 degrees C - 60 degrees C by this mixing chamber 2. In addition, since the description of the solid organic waste

usually collected is not changed not much sharply, the moisture content is also stable to some extent, and the amount of the mixed liquor to return is usually set as the 1 to 1.5 times as many range as this to the mass of a solid organic waste.

[0054] Here, since it becomes inadequate stirring mixing in the case of methane fermentation processing and methane fermentation processing of a back process becomes impossible efficiently it TS concentration becomes higher than 15%, TS concentration is preferably made 13% or less 15% or less. Furthermore, if TS concentration becomes lower than 10%, since it will be in the condition that the moisture content increased and the rate of the organic substance decreased and the effectiveness of methane fermentation processing at a back process will fall, it sets up to 10% or more. Moreover, or there are few massive objects etc., the methane fermentation processing by the microorganism advances more efficiently by considering as the shape of a slurry in the condition that there is almost nothing. When the living thing sludge which is not dehydrated by the latter solubilization tub 4 is thrown in from this, TS concentration in a mixing chamber 2 carries out the temper of adjusting more highly from 15% etc. so that TS concentration in the condition of being supplied to the methane fermentation tub 7 may become 15% or less 10% or more.

[0055] Impurity from which the liquefied organic waste which was made to pile up from about 1 hour for about 4 hours, and carried out stirring mixing, and which carried out the temper to the shape of a slurry, keeping it warm at about 55 degrees C - 60 degrees C by this mixing chamber 2 was not able to be removed on the drum details screen which the filtration means 3 does not illustrate, such as a fine bag made of synthetic resin and plastics, is removed. And the liquefied organic waste from which impurity was removed with the filtration means 3 is thrown into the solubilization tub 4. In addition, the impurity removed on the drum details screen of the filtration means 3 is dehydrated in a screw press, composting processing of the dehydration solid is carried out, and dehydration filtrate is thrown into the solubilization tub 4.

[0056] Moreover, being kept warm by the about 55 degrees C - 60 degrees C elevated temperature with the incubation means which is not illustrated, and the mixed liquor of the liquefied organic waste thrown into the solubilization tub 4 and dehydration filtrate being stirred with a stirring means, from the nutrient salt addition means 5, the nutrient salt of a microorganism is added, by stagnation of an about [2 day - 3 day], souring of it is solubilized and carried out, and a temper is carried out. In addition, the rate of solubilization becomes about 30% - 60% by this solubilization processing.

[0057] And preferably, as a part for 10 mg/l - 300 mg/l and nickel, as a part for 1 mg/l - 30 mg/l and cobalt, in the case of addition of nutrient salt, 1 or more mg/l of 1 or more mg/l of 10 or more mg/l of iron adds in mixed liquor so that it may become 1 mg/l - 30 mg/l preferably.

[0058] Here, since the difference in the effectiveness by iron addition will not be accepted but cost will increase even if an improvement of methane fermentation processing in the latter part is not accepted but it increases more than 300 mg/l if an iron addition becomes less than 10 mg/l, an iron addition adds 10 or more mg/l of iron compounds so that it may become 300 or less mg/l 10mg [l.] or more preferably. Moreover, since the difference in the effectiveness by nickel addition will not be accepted but cost will increase similarly even if an improvement of methane fermentation processing in the latter part is not accepted but it increases more than 30 mg/l if a nickel addition becomes less than 1 mg/l, a nickel addition adds 1 or more mg/l of nickel compounds so that it may become 30 or less mg/l more than per mg/l preferably. Furthermore, since the difference in the effectiveness by cobalt addition will not be accepted but cost will increase similarly even if an improvement of methane fermentation processing in the latter part is not accepted but it increases more than 30 mg/l if a cobalt addition becomes less than 1 mg/l, a cobalt addition adds 1 or more mg/l of cobalt compounds so that it may become 30 or less mg/l more than per mg/l preferably.

[0059] Moreover, when the rate which adds living thing sludge when the living thing sludge which is excess sludge separately produced in treatment of human waste etc. is thrown into the solubilization tub 4 through the injection way 6 becomes 25% or more by TS concentration, since the nutrient salt of the minute amount which run short with a solid organic waste is filled up from living thing sludge, it does not need to add nutrient salt on this condition.

[0060] And make the mixed liquor by which the temper was carried out by the solubilization tub 4 flow into the methane fermentation tub 7, for example, it is made to pile up for seven - 15 days, stirring suitably at 55 degrees C, and methane fermentation processing of the mixed liquor is carried out with a methanation bacillus etc. In addition, the methane collection means which is not illustrated recovers the methane generated by methane fermentation processing, it is stored in a gas holder 8, and is used for the kinetic energy in the case of processing of a solid organic waste, other sewage disposal, an air conditioning, etc. by generation of electrical energy etc.

[0061] By this methane fermentation, cell mass with the sufficient mixed liquor in the methane fermentation tub 7 and TS concentration in the condition of being easy to stir become 3% - about 6%. Moreover, ammoniacal nitrogen concentration turns into 2000 - 3500 mg/l extent. In addition, if it is ammoniacal nitrogen concentration of this level, processing inhibition will not be produced in the methane fermentation in a moderate temperature. However, since the organic acid by ammoniacal nitrogen carries out extensive are recording and produces processing inhibition when carrying out methane fermentation processing at a 55**5-degree C elevated temperature, it is necessary to carry out methane fermentation processing with a moderate temperature.

[0062] And a part of mixed liquor by which methane fermentation processing was carried out is returned to a mixing chamber 2 through the return means 9, and it is mixed with the solid organic waste from the pretreatment means 1. Alkali, such as a sodium hydroxide, is added with the alkali adjustment device of the heat alkali treatment means 10 of the return means 9, pH is adjusted to nine to about ten, and this mixed liquor returned makes the organic nature solid which is hard to disassemble by the methane fermentation processing which remains while making the bacteria in mixed liquor become extinct and solubilize reform and solubilize. Furthermore, while heating mixed liquor at 70 degrees C - about 90 degrees C with steam and making the anaerobic bacterium in mixed liquor become extinct and solubilize with the heat treatment means of the heat alkali treatment means 10 of the return means 9, steam stripping is carried out and nitrides, such as ammoniacal nitrogen in mixed liquor, are removed. And heating and the mixed liquor by which alkali treatment was carried out flow into a mixing chamber 2 with a heat alkali treatment means, and it is mixed with a solid organic waste. In addition, the steam containing a nitride has the inside of the aqueous acids stored in the acid tub of the ammonia recovery means 11 penetrated, it deposits as an ammonium sulfate, an ammonium chloride, etc., and nitrides are collected.

[0063] In addition, when it has been recognized that pH serves as acidity from about five with pH detection means by the solubilization tub 4, the solubilization tub 4 is made to supply and neutralize a part of mixed liquor by which heat alkali treatment was carried out through the return injection way 12 from the heat alkali treatment means 10, and it is made for pH not to serve as acidity from about five.

[0064] On the other hand, the remainder of the mixed liquor by which methane fermentation processing was carried out flows into the dehydration means 13. And it dehydrates, after a polymer coagulant is added with a flocculant addition means and solid content condenses, and solid liquid separation of the mixed liquor is carried out to dehydration filtrate and a dewatered sludge cake. Then, purification processing of the dehydration filtrate by which dehydration separation was carried out is carried out with the waste-water-treatment means 14, and the dewatered sludge cake by which dehydration separation was carried out is composted with the dewatered sludge processing means 15.

[0065] Next, an operation of one gestalt of the above-mentioned implementation is explained.

[0066] First, the case where it processes without mixing living thing sludge, using garbage as a solid organic waste is explained.

[0067] And leftover food, such as vegetables which are garbage from the works which manufacture a dining-room, a center for providing meals, and a box lunch for delivery, fruits, meat, a fish, and rice, was crushed in the shape of a slurry by mixed stirring, and water content used about 80% (TS concentration is about 20%) of synthetic kitchen garbage as the solid organic waste.

[0068] The description of this garbage is shown in Table 1.

[0069]

[Table 1]

含 水 率	8 0 %
T S 濃 度	2 0 %
V S 濃 度	1 8 . 6 %
V S / T S	9 3 %
C O D _{cr} 濃度	3 0 0 k g / t
T - N 濃 度	7 . 5 k g / t

And at the mixing chamber 2, it piled up at 55 degrees C at stagnation and the solubilization tub 4 for 3 hours, and piled up for 12 days at 35 degrees C for three days by 60 degrees C at stagnation and the methane fermentation tub 7, and the amount returned through the return means 9 from the methane fermentation tub 7 was processed on the conditions mixed with garbage by the mixing chamber 2 1:1. Moreover, ferric chloride 100 mg/l, nickel chloride 10 mg/l, and cobalt chloride 10 mg/l were added as nutrient salt, respectively. Furthermore, the heat alkali treatment of the mixed liquor to return was controlled to be set to pH9.5 using a sodium hydroxide, heating at 80-85 degrees C with steam. Moreover, it considered as the configuration processed as a comparison using the dilution water shown in drawing 2. And comparison examination was carried out about each processing load, cracking severity, the gas yield, the amount of dilution waters, and the displacement after processing. The result is shown in Table 2.

[0070]

[Table 2]

		本実施の形態	比 較 例
操 作 条 件	栄 養 塩 添 加 の 有 無	あり	なし
	メタン発酵槽混合液の返送	あり	なし
	返送ラインでの熱アルカリ処理	あり	なし
	運転可能なCOD _{cr} 容積負荷 (k g / m ³ / 日)	1 0 ~ 2 0	6 以下
分 解 率 (%)	T S	8 0 ~ 8 5	6 5 ~ 7 5
	V S	8 5 ~ 9 0	7 0 ~ 8 0
	C O D _{cr}	8 5 ~ 9 0	7 0 ~ 8 0
バイオガス生成量 (m ³ / t 厨芥)		1 3 0 ~ 1 5 0	1 1 0 ~ 1 3 0
希釈水の使用量 (m ³ / t 厨芥)		0	1 . 0
要処理排水の発生量 (m ³ / t 厨芥)		1 . 2	2 . 4
汚泥脱水後の発生量 (kg / t 厨芥)		3 0 ~ 4 0	5 0 ~ 7 0

The result shown in this table 2 shows that cracking severity improves about 1 to twenty percent, the amount of methane generation is also increasing about 1 to twenty percent, and its processing effectiveness is improving although the volume load of the chemical oxygen demand (COD_{Cr}) in connection with the living thing difficulty resolvability organic substance is more than a **** time. And TS concentration after processing of the methane fermentation tub 7 was about about 4 - 6%.

[0071] Moreover, it is a dilution water 1.0m per 1t of garbage in the wastewater returned from a wastewater-treatment means in the example of a comparison 3 Although required, with the gestalt of this operation, the dilution water has been processed good in processing operation by which processing was

stabilized in the request using the dilution water for adjustment of TS concentration in the early stages of processing, even if it did not use it at all. For this reason, with the gestalt of this operation, it functioned as a carrier through which the moisture added at the time of the early stages of operation circulates from a mixing chamber 2 to a mixing chamber 2 again through the methane fermentation tub 7 and the return means 9, and since the moisture after processing turned into moisture of garbage itself, the amount of the treated waste water processed in the latter part as compared with the example of a comparison also became below one half.

[0072] And with the gestalt of this operation, since a dilution water is not used, the amount of water warmed by the mixing chamber 2 decreases, and operation cost decreases. That is, in order to process 1t garbage (TS concentration is about 20%), it is necessary to add about 1t of dilution waters, and to warm and prepare the liquefied organic waste of the shape of a slurry which is 2t whose TS concentration is about 10% in total in the example of a comparison using a dilution water. On the other hand, with the gestalt of this operation, since the mixed liquor returned to a mixing chamber 2 is already warmed, that what is necessary is just to warm a part for 1t of garbage, it can carry out abbreviation one half extent reduction of the energy for warming, and can reduce processing cost.

[0073] Moreover, since the 20 remaining% by which, as for the mixture processed by the conventional methane fermentation tub 7, the organic substance is not processed at the maximum at about 80% is the organic substance of difficulty resolvability, while the amount of [which is produced according to dehydration separation] sludge increases in the anaerobic microorganism and methane fermentation processing which are the organic substance, the soluble difficulty resolvability organic substance remains in treated waste water, and the load of the sewage disposal in the latter part increases. In order to carry out heat alkali treatment of the mixed liquor returned to a mixing chamber 2 from the methane fermentation tub 7 with the gestalt of this operation, while the propagated anaerobic microorganism is become extinct and solubilized on the other hand From the percentage which the difficulty resolvability organic substance which is hard to disassemble by methane fermentation processing is also disassembled, and is decomposed into an easily decomposable organic matter by these heat alkali treatment being about 60% The maximum elimination factor of the organic substance discharged after methane fermentation processing It is set to $0.8 + (0.2 \times 0.6) = 0.92$, and the organic substance is disassembled about 92% at the maximum. The organic substance which remains can decrease in number to about 8%, it can save a dilution water while it can reduce reduction of sludge, and the load of the sewage disposal in the latter part, and from processing by no diluting further, equipment structure is simplified and it can attain a miniaturization easily while being able to process efficiently.

[0074] Furthermore, the amount of ammoniacal nitrogen in the methane fermentation tub 7 did not exceed 2500 ppm. That is, it also turns out that ammonia removal is carried out in the stripping by the steam in the case of heat alkali treatment, there are 3500 ppm or more of nothings that are checked in the case of methane fermentation processing and to give to especially 5000 ppm, and it can process no diluting good.

[0075] Next, the case where living thing sludge is mixed and processed is explained.

[0076] As living thing sludge, the excess sludge of a human waste treatment plant was used using the garbage shown in Table 1 as a solid organic waste. In addition, the mixed rate of garbage and living thing sludge was made into garbage:living thing sludge =75%:25% by the dry mass ratio. And the description of such mixture is shown in Table 3.

[0077]

[Table 3]

含 水 率	8 2 %
T S 濃 度	1 8 %
V S 濃 度	1 5 . 3 %
V S / T S	8 5 %
C O D _{cr} 濃度	2 9 0 k g / t
T - N 濃 度	7 . 5 k g / t

And it processed on the same conditions as processing of the above-mentioned garbage. In addition, nutrient salt was not added. And comparison examination was carried out about each processing load, cracking severity, the gas yield, the amount of dilution waters, and the displacement after processing. The result is shown in Table 4.

[0078]

[Table 4]

		本実施の形態	比 較 例
メタン発酵槽混合液の返送		あり	なし
返送ラインでの熱アルカリ処理		あり	なし
C O D _{cr} 容積負荷 (k g / m ³ / 日)		2 0	1 0
分 解 率 (%)	T S	7 0	5 5
	V S	8 0	6 5
	C O D _{cr}	8 0	6 5
バイオガス生成量 (m ³ / t 混合物)		1 3 5	1 1 0
希釈水の使用量 (m ³ / t 混合物)		0	1 . 0
要処理排水の発生量 (m ³ / t 混合物)		1 . 2	2 . 4
汚泥脱水ケーキの発生量 (kg / t 混合物)		5 5	8 0

The result shown in this table 4 shows that cracking severity improves about twenty percent, the amount of methane generation is also increasing about twenty percent, and its processing effectiveness is improving like the processing result shown in Table 2 although the volume load of the chemical oxygen demand (COD_{Cr}) in connection with the living thing difficulty resolvability organic substance is twice. Moreover, at the example of a comparison, it is a dilution water 1.0m per 1t of mixture 3 Although require, even if it did not use the dilution water at all, with the gestalt of this operation, in processing operation by which processing was stabilized in the request using the dilution water for adjustment of TS concentration in the early stages of processing, it could process good, and the amount of the treated waste water process in the latter part is also one half, and the amount of sludge also decreased a little more than 30 percent.

[0079] Furthermore, since it processed with the processing shown in Table 2 more than equivalent in spite of having not added nutrient salt, it turns out that nutrient salt is supplied from living thing sludge.

[0080] In case the solid organic waste to process is adjusted so that it may become 10 - 15% by TS concentration in order to carry out methane fermentation processing efficiently as mentioned above, in order to mix and adjust the mixed liquor in the methane fermentation tub which carried out methane fermentation processing, The displacement by which a dilution water becomes unnecessary, solid liquid separation is carried out with the dehydration means 13, and purification processing is carried out with the waste-water-treatment means 14 decreases greatly. Since the organic substance which remains is

also returned and it is again processed while the processing load of the waste-water-treatment means 14 decreases, being able to process by low cost efficiently and being able to attain the miniaturization of equipment easily, cracking severity improves, processing effectiveness improves and the amount of methane collected can also increase.

[0081] And since the sludge by which methane fermentation processing was carried out, and a solid organic waste are mixed at a rate that TS concentration becomes 15% or less 10% or more, it becomes concentration [fitness / at the time of carrying out methane fermentation processing], and methane fermentation processing effectiveness can be improved.

[0082] Moreover, since it mixes with a solid organic waste after removing a nitride from the sludge by which methane fermentation processing was carried out, are recording of a nitride can be prevented and processing effectiveness can be improved, without checking methane fermentation processing.

[0083] And since removal of this nitride is based on stripping processing, it can carry out separation removal from sludge easily with an easy configuration, without adding an additive, and can improve processing effectiveness.

[0084] Furthermore, since sludge is contacted in steam and a nitride is removed by the stripping processing by steam, while a nitride is easily removable with an easy configuration The energy which sludge is heated with steam, and is heated in case it mixes with a solid organic waste and TS concentration is adjusted can be reduced. Moreover, since the bacteria in sludge will be become extinct and solubilized and will be processed by methane fermentation processing in the latter part, the amount of sludge generated by processing of a solid organic waste can be reduced, and a solid organic waste can be processed efficiently.

[0085] Moreover, since it mixes with a solid organic waste after reforming and solubilizing the organic substance which remains while adding alkali and becoming extinct and solubilizing bacteria, heating to the sludge by which methane fermentation processing was carried out and which is hard to disassemble, bacteria and the organic substance which remains can be disassembled by latter methane fermentation processing, the amount of sludge generated by processing of a solid organic waste can be reduced, and a solid organic waste can be processed efficiently.

[0086] And since stripping processing of the nitride in sludge is carried out by contact of steam, separation removal is easily carried out from sludge and are recording of a nitride is prevented while being able to heat easily with an easy configuration, since it contacts and steam is heated, in case alkali is added, the load in the case of methane fermentation processing can be reduced, methane fermentation processing advances efficiently, and processing effectiveness can be improved.

[0087] Moreover, since methane fermentation processing is carried out at the mixture of the sludge by which methane fermentation processing was carried out, and a solid organic waste and heating and some alkaline sludge [at least] which carried out alkali treatment are added in the case of methane fermentation processing, it can prevent that an acid degree advances in the organic acid generated in the case of methane fermentation processing, bioactive falls, and processing effectiveness decreases.

[0088] And since [of an iron compound, a cobalt compound, and a nickel compound] any one sort is added at least, nutrient salt balance required for the activity of a microorganism can be secured to the mixture of the sludge by which methane fermentation processing was carried out, and a solid organic waste, and methane fermentation processing effectiveness can be improved into it.

[0089] Furthermore, while moisture is supplied from excess sludge and being able to adjust TS concentration easily by adding suitably the excess sludge produced by biological treatment into the mixture of the sludge and the solid organic waste by which methane fermentation processing was carried out, nutrient salt required for the activity of a microorganism can be supplied from excess sludge, and it is not necessary to add nutrient salt separately, and it can improve, and the excess sludge produced by biological treatment can also double and process processing effectiveness.

[0090] Moreover, since it returns where the sludge by which methane fermentation processing was carried out is kept warm, and it mixes with a solid organic waste, the energy heated in case it mixes with a solid organic waste and TS concentration is adjusted can be reduced, and processing effectiveness can be improved.

[0091] And since it mixes with the sludge by which methane fermentation processing was carried out after removing impurity from a solid organic waste, while being able to adjust TS concentration easily, it is not necessary to heat a part for impurity in the case of adjustment of TS concentration, the energy efficiency to heat can be improved, and processing effectiveness can be improved. Furthermore, generating of Society for Cutting Up Men by impurity can be prevented, in order to prevent reduction of the processing volume by generating of Society for Cutting Up Men, the activity which removes Society for Cutting Up Men becomes unnecessary, and it can process easily and efficiently.

[0092] Moreover, since methane fermentation processing is carried out in a 35**5-degree C moderate temperature region, 15% or less and a comparatively high heavy load can also control the fall of the microorganism activity by extensive generating of an organic acid 10% or more, and the methane fermentation processing of the TS concentration can be carried out efficiently.

[0093] Furthermore, since solubilization processing is carried out before methane fermentation processing at 55-degree-C or more elevated temperature 60 degrees C or less, the organic substance can be efficiently solubilized to altitude, it can increase and the amount of organic substance finally processed by methane fermentation processing in the latter part can be processed efficiently. And while being able to prevent propagation of the microorganism which does not contribute to processing of the organic substance but becomes harmful to men and beasts by solubilization processing further in an elevated temperature, for example, becoming that methane-fermentation processing is possible about the cake in the latter part at the special heat energy heated in the case of solubilization processing, without heating with a heating means separately in the case of methane-fermentation processing while being able to carry out direct use at fertilizer etc., without processing and being able to simplify a configuration, reduction of operation cost can plan.

[0094] In addition, in the gestalt of the above-mentioned implementation, although the pretreatment means 1 was constituted from solution shredding equipment, a metal removal means, and a sorting means, that which configuration which removes impurity may be used and there are few amounts of impurity etc. may remove impurity in one before carrying out methane fermentation processing according to the description of the solid organic waste to process, without establishing the pretreatment means 1 of locations. Furthermore, it is not necessary to also establish the filtration means 3. In addition, as mentioned above, while being able to perform preparation of TS concentration easily by removing impurity beforehand, the latter filtration means 3 can remove impurity to altitude, and the methane fermentation processing effectiveness in the latter part can be improved. And further, as shown in drawing 2, the filtration means 3 may be located and formed in the upstream of the methane fermentation tub 7 from the downstream of the solubilization tub 4.

[0095] Moreover, which approaches, such as using not only stripping but a flocculant, may be used for removal of a nitride.

[0096] Furthermore, it is not necessary to carry out heat alkali treatment.

[0097] And the solid organic waste of a processing object is not restricted to a kitchen garbage etc.

[0098] Moreover, although the nutrient of either an iron compound, a cobalt compound and a nickel compound was added and explained, when inactive effectiveness does not increase according to the description to process, it is not necessary to add and it is also good for either an iron compound, a cobalt compound and a nickel compound to see according to the description of a solid organic waste.

[0099]

[Effect of the Invention] In order according to the waste treatment approach according to claim 1 to carry out methane fermentation processing again after returning the sludge by which methane fermentation processing was carried out to a solid organic waste and mixing, While being able to carry out a temper to the total solid concentration (TS concentration) which did not need to add and dilute water to a solid organic waste, and was suitable for methane fermentation processing, being able to improve methane fermentation processing effectiveness and being able to increase the amount of generation of methane The amount of the wastewater discharged and the amount of excess sludge can be reduced, the load of purification processing of wastewater and processing of excess sludge can be reduced at a back process, and a solid organic waste can be processed efficiently.

[0100] Since the sludge by which methane fermentation processing was carried out, and a solid organic waste are mixed [according to the waste treatment approach according to claim 2] at a rate that TS concentration becomes 15% or less 10% or more in addition to the effectiveness of the waste treatment approach according to claim 1, it becomes concentration [fitness / at the time of carrying out methane fermentation processing], and methane fermentation processing effectiveness can be improved.

[0101] Since according to the waste treatment approach according to claim 3 it mixes with a solid organic waste after removing a nitride from the sludge by which methane fermentation processing was carried out in addition to the effectiveness of the waste treatment approach according to claim 1 or 2, are recording of a nitride can be prevented, and it can process efficiently, without checking methane fermentation processing.

[0102] According to the waste treatment approach according to claim 4, since a nitride is removed by stripping processing in addition to the effectiveness of the waste treatment approach according to claim 3, separation removal can be easily carried out with an easy configuration, without adding an additive, and processing effectiveness can be improved.

[0103] In order according to the waste treatment approach according to claim 5 in addition to the effectiveness of the waste treatment approach according to claim 4 to contact steam to sludge and to remove a nitride by the stripping processing by steam, While a nitride is easily removable with an easy configuration, sludge is heated by steam. Since the energy heated in case it mixes with a solid organic waste and TS concentration is adjusted can be reduced, and the bacteria in sludge will be become extinct and solubilized and it will be processed by methane fermentation processing in the latter part The amount of sludge generated by processing of a solid organic waste can be reduced, and a solid organic waste can be processed efficiently.

[0104] According to the waste treatment approach according to claim 6, it adds to the effectiveness of the waste treatment approach claim 1 thru/or given [any 1] in five. In order to mix with a solid organic waste after reforming and solubilizing the organic substance which remains while adding alkali and becoming extinct and solubilizing bacteria, heating to the sludge by which methane fermentation processing was carried out and which is hard to disassemble, Since bacteria and the organic substance which remains are disassembled by latter methane fermentation processing, the amount of sludge generated by processing of a solid organic waste can be reduced, and a solid organic waste can be processed efficiently.

[0105] Since according to the waste treatment approach according to claim 7 in addition to the effectiveness of the waste treatment approach according to claim 6 steam is contacted and is heated, in case alkali is added, while being able to heat easily with an easy configuration Since stripping processing of the nitride in sludge is carried out by contact of steam and separation removal is easily carried out from sludge, are recording of a nitride can be prevented, the load in the case of methane fermentation processing decreases, methane fermentation processing advances efficiently, and processing effectiveness can be improved.

[0106] According to the waste treatment approach according to claim 8, it adds to the effectiveness of the waste treatment approach according to claim 6 or 7. In order to carry out methane fermentation processing at the mixture of the sludge by which methane fermentation processing was carried out on the occasion of methane fermentation processing, and a solid organic waste and to add heating and some alkaline sludge [at least] by which alkali treatment was carried out, When an acid degree advances in the organic acid generated in the case of methane fermentation processing, it can prevent that bioactive falls and processing effectiveness decreases, and processing effectiveness can be improved.

[0107] According to the waste treatment approach according to claim 9, in addition to the effectiveness of the waste treatment approach claim 1 thru/or given [any 1] in eight, since [of an iron compound, a cobalt compound and a nickel compound] any one sort is added at least, nutrient salt balance required for the activity of a microorganism can be secured to the mixture of the sludge by which methane fermentation processing was carried out, and a solid organic waste, and methane fermentation processing effectiveness can be improved into it.

[0108] In order to add [according to the waste treatment approach according to claim 10] the excess

sludge produced by biological treatment into the mixture of the sludge and the solid organic waste by which methane fermentation processing was carried out in addition to the effectiveness of the waste treatment approach claim 1 thru/or given [any 1] in nine, While moisture is supplied from excess sludge and being able to adjust TS concentration easily, nutrient salt required for the activity of a microorganism is supplied from excess sludge, and it is not necessary to add nutrient salt separately, and processing effectiveness can be improved and the excess sludge produced by biological treatment can also be processed.

[0109] Since according to the waste treatment approach according to claim 11 it returns where the sludge by which methane fermentation processing was carried out is kept warm in addition to the effectiveness of the waste treatment approach claim 1 thru/or given [any 1] in ten, and it mixes with a solid organic waste, the energy heated in case it mixes with a solid organic waste and TS concentration is adjusted can be reduced, and processing effectiveness can be improved.

[0110] Since according to the waste treatment approach according to claim 12 in addition to the effectiveness of the waste treatment approach claim 1 thru/or given [any 1] in 11 it mixes with the sludge by which methane fermentation processing was carried out after removing impurity from a solid organic waste, while being able to adjust TS concentration easily, it is not necessary to heat a part for impurity in the case of adjustment of TS concentration, the energy efficiency for heating can be improved, and processing effectiveness can be improved.

[0111] Since according to the waste treatment approach according to claim 13 methane fermentation processing is carried out after mixing the sludge and the solid organic waste by which methane fermentation processing was carried out in addition to the effectiveness of the waste treatment approach claim 1 thru/or given [any 1] in 12 and removing impurity, while being able to reduce the load in the case of methane fermentation processing, it is not necessary to heat a part for impurity in the case of methane fermentation processing, and processing effectiveness can be improved.

[0112] According to the waste treatment approach according to claim 14, since methane fermentation processing is carried out in a 35**5-degree C moderate temperature region in addition to the effectiveness of the waste treatment approach claim 1 thru/or given [any 1] in 13, a heavy load can also control the fall of the microorganism activity by extensive generating of an organic acid, and can carry out methane fermentation processing efficiently.

[Translation done.]